This Application Note focuses on solder reflow recommendation for packages with Matte Tin and Tin/ Lead finishes.

The five transition periods for the typical reflow process are:

1. **Preheat** – From 25°C to 80-150°C and evaporates solvents from the solder paste.
2. **Flux Activation** – Dried solder paste is heated to a temperature in which the flux will react with the oxide and contaminants on the surfaces to be joined.
3. **Thermal Equalization** – Achieves temperature equalization approximately 25-50°C below the reflow temperature. Actual time and temperature will depend on the mass and materials used.
4. **Reflow** – In this stage, the assembly is brought to the temperature sufficient to produce reflow of the solder. Note the "wetting time" is shown as the time the solder is in a liquid state on the curve.
5. **Cool Down** – This is the final stage in the process where gradual cooling should be used. Slower cool down produces a finer grain structure in the solder joint, which will yield a more fatigue-resistant solder joint.

Figure 1: Reflow profiles for Sn-Pb and Pb-free assemblies

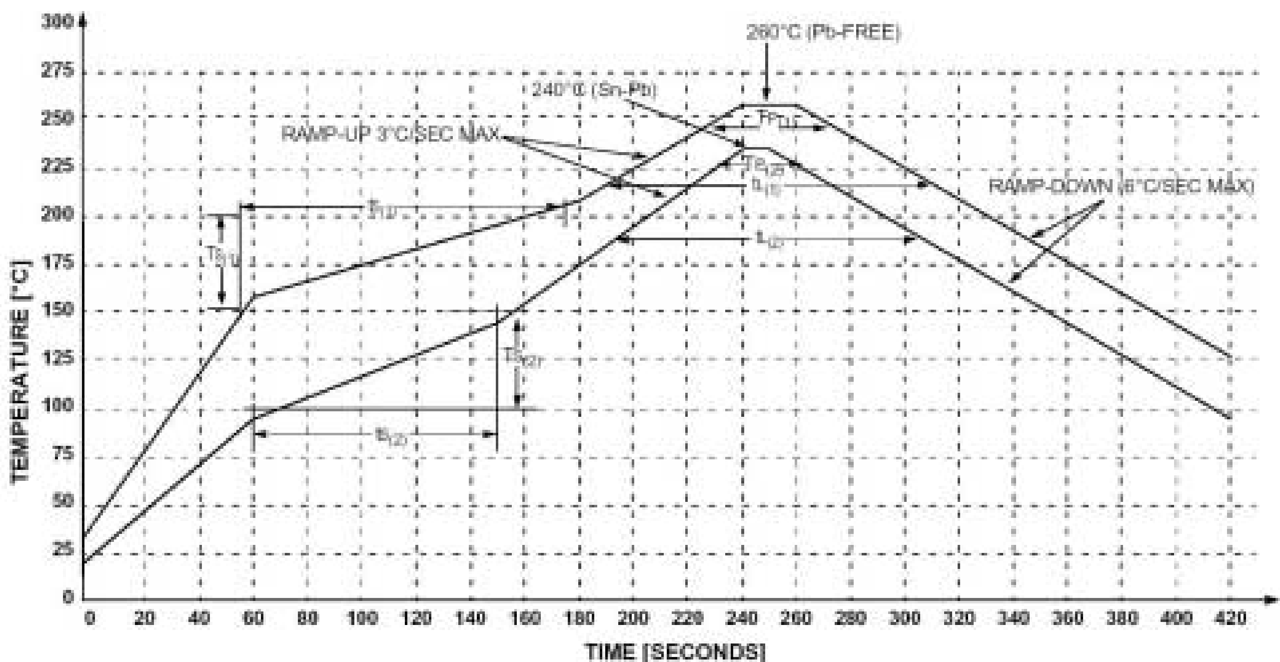


TABLE 1: TIME AND TEMPERATURE PARAMETRICS

Sym.	Min.	Max.	Units	Test Conditions
$Ts_{(1)}$	150	200	°C	Pb-Free
$Ts_{(2)}$	100	150	°C	Sn-Pb
$ts_{(1)}$	60	180	Sec	Pb-Free
$ts_{(2)}$	60	120	Sec	Sn-Pb
$tl_{(1)}$	60	150	Sec	Pb-Free
$tl_{(2)}$	60	150	Sec	Sn-Pb
$Tp_{(1)}$	245	260	°C	Pb-Free
$Tp_{(2)}$	225	240	°C	Sn-Pb

Solder Reflow Recommendations

Figure 2 shows recommended profiles for Pb-free devices. These devices are plated with matte Tin (Pure Sn) and contain no lead. They can be used in standard tin-lead (SnPb) applications, using a profile that is equal to or above the lower line in the plot, or in Pb-free solder such as Tin-Silver-Copper (Sn-Ag-Cu) with profiles up to and including the upper line on the plot.

Figure 3 shows recommended profiles for standard devices with 63%/37% tin-lead (Sn-Pb) solder finish. The reflow profile for these devices can be anywhere between the upper and lower curves shown in Figure 3. Please note that the peak temperature is lower than that of the Pb-free devices.

Figure 2: Reflow recommendation for Pb-free devices

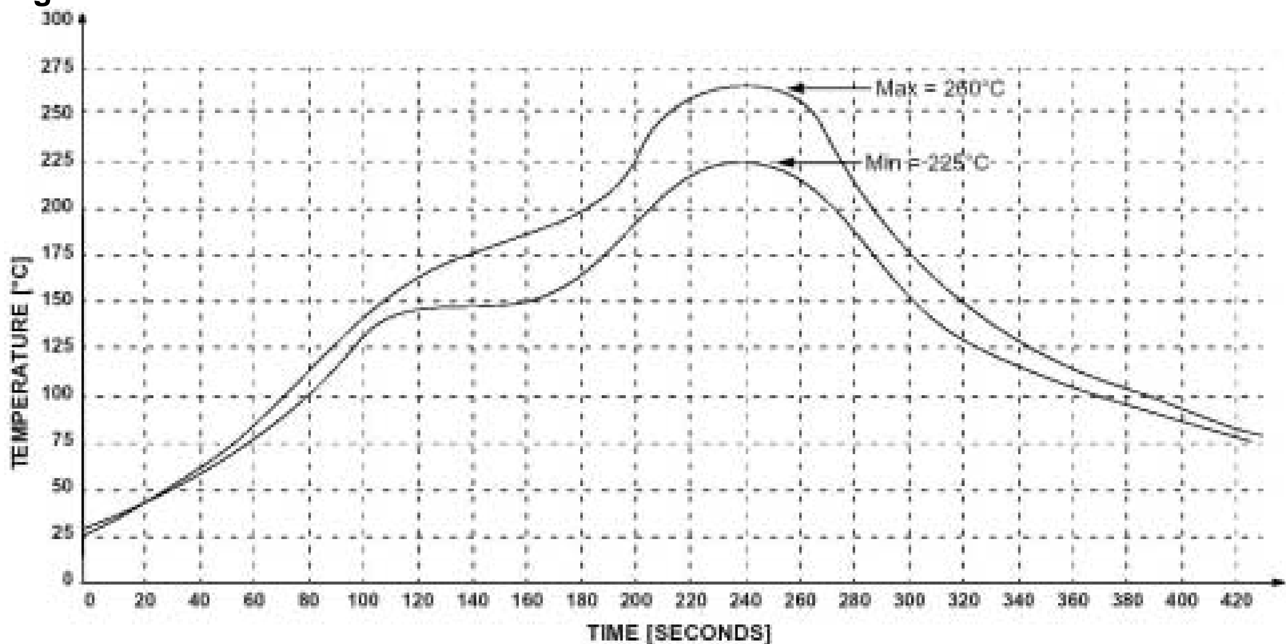
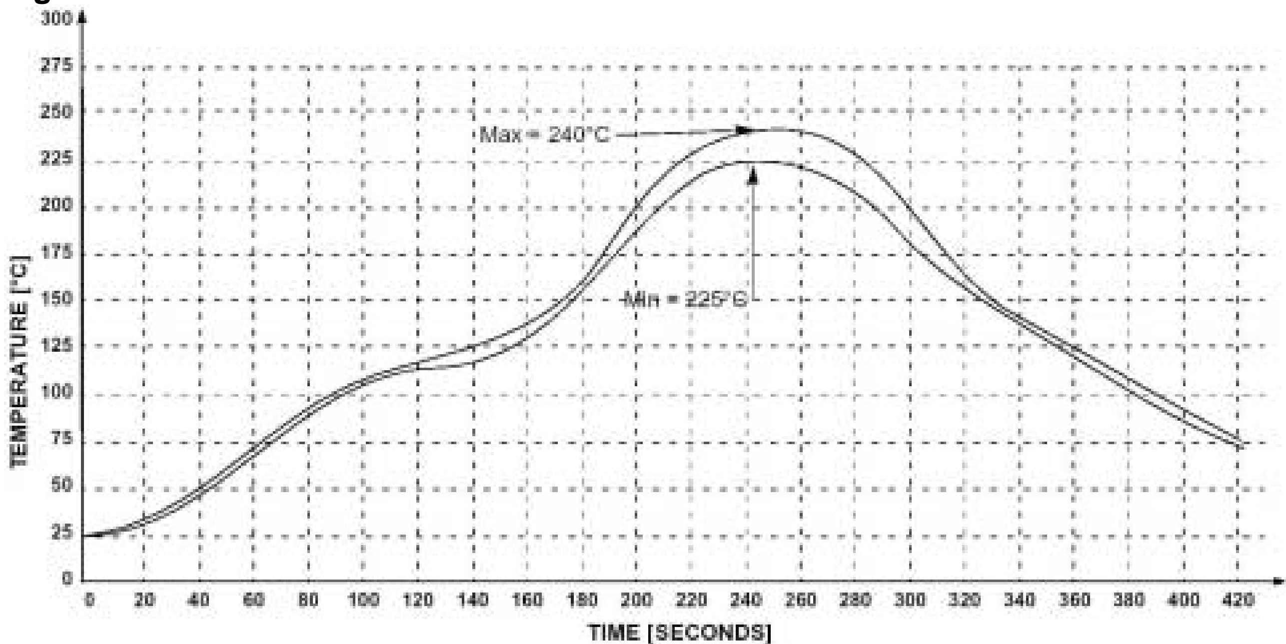


Figure 3: Reflow recommendation for standard devices



This Application Note addresses the use of Matte Tin and Tin/Lead finishes, and recommends staying within the limits shown in Figure 2 and Figure 3. However, factors such as circuit board thickness, size, package type, and reflow equipment may affect the total profile time.

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